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Intra-aggregate distribution of soil water repellency in Mediterranean forest soils

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1. INTRODUCTION

Water repellency (WR) is a property of many soils that retards infiltration, so increasing runoff rates and soil erosion risk (García-Moreno et al., 2013), and contributing to the development of uneven wetting patterns (Granged et al., 2011), among other important consequences (Jordán et al., 2013). Many studies focus on the causes and effects of a surface or subsurface water-repellent layer on soil properties. Also, soil WR has been studied in relation with other soil physical properties as texture (González-Peñaloza et al., 2013), the proportion of coarse particles or size distribution of aggregates (Zavala et al., 2010). But few studies exist dealing with the distribution of WR in individual aggregates (Urbanek et al., 2007). Information on the internal distribution of WR in aggregates may help to understand the causes of hydrophobicity and its impact on related properties, as stability of aggregates.

In order to understand the interaction between hydrophobic organic substances and individual aggregates, we have studied: [i] the distribution of the intensity (determined with the ethanol percentage test) and severity of WR (determined with the water drop penetration test, WDPT) in aggregate sieve fractions and [ii] the internal distribution of hydrophobicity in aggregates from water-repellent Mediterranean burned and unburned forest soils.

2. RESULTS

In unburned soils, we found that WR showed great differences between aggregates of different sizes, with finer aggregates showing the largest organic C content and WR. Generally, hydrophobicity distributed through all the body of aggregates, but both severity and intensity of WR were higher at the exposed surface. Only in some cases, subcritical WR (WDPT < 5 s) was observed, but WDPT was always > 0 s. Aggregates form burned soils showed similar behavior, although part of the samples showed increased intensity and severity of WR.

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